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(पहला पुनरीक्षण)

Indian Standard

WINDING IN MINES — SHEAVES — CAST — SPECIFICATION

(First Revision)

ICS 21 100 73 100 99

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

September 1999

Price Group 6

Mining Techniques and Equipment Sectional Committee, HMD 8

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Mining Techniques and Equipment Sectional Committee had been approved by the Heavy Mechanical Engineering Division Council

This standard was first published in 1979 In this revision, a number of sizes of sheaves have been included In addition, a method of test for conducting the proof load test on the sheaves has also been included

The sheaves conforming to the requirements of this standard are suitable for use in new installations The sheaves conforming to this standard may also be used for replacement of the sheaves in the existing installations However, in case of any difficulty, sheaves with the existing dimensions may be continued to be used

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 1960 'Rules for rounding off numerical values (*revised*)' The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard

Indian Standard

WINDING IN MINES — SHEAVES — CAST — SPECIFICATION

(First Revision)

1 SCOPE

This standard covers the requirements for cast sheaves and bearing blocks for winding in mines using locked coil ropes of different sizes

2 REFERENCES

The Indian Standards listed in Annex A are necessary adjuncts to this standard

3 TERMINOLOGY

3.1 Static Rope Tension (Safe Working Load)

The maximum static rope tension to which the head gear sheaves and the bearing blocks can be loaded It includes the weight of the rope also.

3.2 Factor of Safety

The ratio of the nominal breaking load of the rope to the static rope tension This shall be higher than 10

4 TYPES

Type A—Sheaves cast in one piece (Sheave diameter from 1 350 to 2 800 mm)

Type B—Sheaves cast in two halves and bolted together at hub and also at rim

5 DIMENSIONS

5.1 Sheaves

Dimensions of sheaves shall be as specified in Table 1 for sheaves of Type A and Tables 2 to 8 for sheaves of Type B

5.1.1 *Sheave Tread*

Dimensions of sheave tread shall be as specified in Table 5.

5.1.1.1 The radius *R* (*see* Table 5) at the bottom of groove of sheave tread shall be as specified in Table 5 The surface roughness of the tread shall be N8

5.1.1.2 The spokes of the sheaves shall be fixed in tread as indicated in Table 5

5.1.1.3 Length of spoke embedded in the hub shall be two times the diameter of the spoke The portion to be embedded shall be machined to form grooves and collars to provide better grip in a similar way as shown in tread portion

6 MATERIAL

Material used in the manufacture of the components of the sheaves shall be as specified below

Components	*Material*
Rim	Grade 25 of IS 210 or equivalent
Hub	Grade 25 of IS 210 or equivalent
Axle (shaft)	Class 5 of IS 1875 or C55Mn75 of IS 1570 (Part 2/Sec 1)
Key	C40 or C55 of IS 2048
Spokes	Steel conforming to IS 8500
Bearings box	Grade 25 of IS 210 or Grease
(Plummer block)	Lubricated plummer block housing for spherical roller bearing
Bearings	Bronze, gun-metal, cast iron lined with white metal or babbit metal

7 GENERAL REQUIREMENTS

7.1 All castings shall be tested ultrasonically/radiographically to ensure that it is free from blow holes, porosity, hard sport, cold sheets, intrusions and other harmful defects

7.2 Axles shall be carefully forged and machined to specified tolerances in order to avoid any possible notch effect When subjected to non-destructive testing like magnetic particle inspection method using current flow technique, etc, or equivalent, the axle shall not show any sign of internal/external/cracks/flaws/defects

7.3 For journal bearings, bearings lined with babbit metal shall be channelled for distribution of lubricants

7.4 Hoops (shrink rings) shall be provided ready for shrinking on hub

7.5 Spokes shall have sound connection with rim and hub

7.6 Arrangements shall be made on plummer blocks for drainage of lubricant and for fixing oil level indicator specially for journal bearing However, all necessary arrangements for lubrication of spherical roller bearings shall be provided if selected

7.7 Two inspection holes of 6 mm dia and plugged with copper rivets shall be provided for measuring the thickness of material in tread These holes shall be situated between the spokes and shall be diametrically opposite to each other

7.8 All bolts and nuts used for fastening shall conform to Grade A of IS 1364 (Part 1) having precision class 12 9. Studs shall conform to IS 1862

8 DESIGNATION

A cast sheave used for winding in mines shall be designated by its diameter, static rope tension, diameter of the rope for which the sheave is to be used and the number of this standard

Example

A sheave of 2 800 mm diameter, static rope tension of 111 5 kN and employed for rope of 21 mm diameter shall be designated as

Sheave 2 800 × 111 5 × 21 IS 9239

9 MARKING

Headgear sheave shall be marked with the following

a) Manufacturer's name or identification mark,
b) Diameter of sheave,
c) Static rope tension for which sheave is designed,
d) Diameter of rope, and
e) Year of manufacture

9.1 BIS Certification Marking

Each headgear sheave may also be marked with the Standard Mark

9.1.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards

10 TESTS AND CERTIFICATE OF TEST

The results of the test conducted in accordance with **10.1**, **10.2** and **10.3** shall be endorsed on a certificate of test (*see* Annex B) A copy of this test certificate shall be provided with every consignment of the headgear sheaves

10.1 The axles of the sheaves when subjected to non-destructive testing, shall not show any sign of cracks or flaws

10.2 Static Balancing Test

The static balancing test of the sheave shall be conducted at the manufacturer's works to the accuracy as agreed between the purchaser and the manufacturer

10.3 Proof Load Test

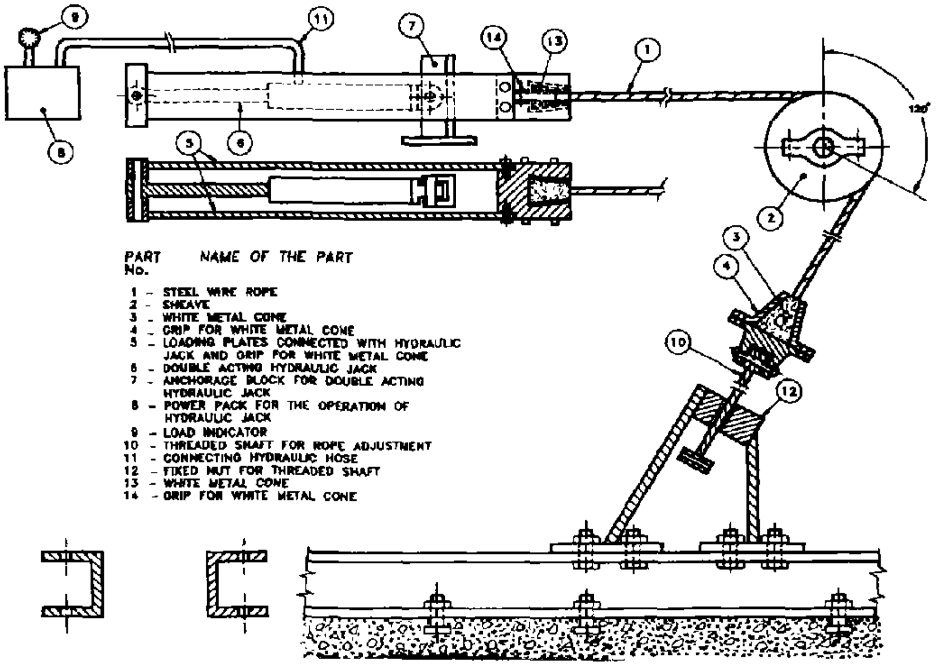
The sheave assembly shall be subjected to a proof load test at the manufacturer's works The test shall consist of applying a load of three times the static rope tension at three places 120° apart in a manner as specified in **10.3.1** to check the sheave for any deformation after the removal of proof load The sheave shall not show any deformation or any abnormality after the removal of proof load

10.3.1 The rope suitable for sheave to be tested is anchored at both ends with white metal cones. The white metal cone is housed within the grip and is connected with the threaded shaft and fixed nut For the purpose of rope length adjustment and application of initial tension for the same. Other white metal cone is housed within the grip which is connected with the loading plates and is subjected to tensile load by operating the double acting hydraulic jack The end of hydraulic jack is fixed with anchor block and the ram end is connected with loading plates The hydraulic jack is operated by the power pack fitted with the load indicator and connecting hose A typical rig for proof load testing of sheaves is shown in Fig 1.

11 INFORMATION TO BE SUPPLIED BY THE PURCHASER

While ordering, the purchaser shall supply the following information to the manufacturer.

a) Type, diameter and material of construction of sheave required, and
b) Wire rope data, that is, type, tensile designation, lay and diameter in accordance with IS 1855 of rope to be used at the mine

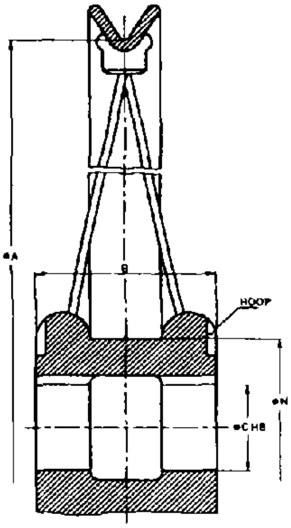


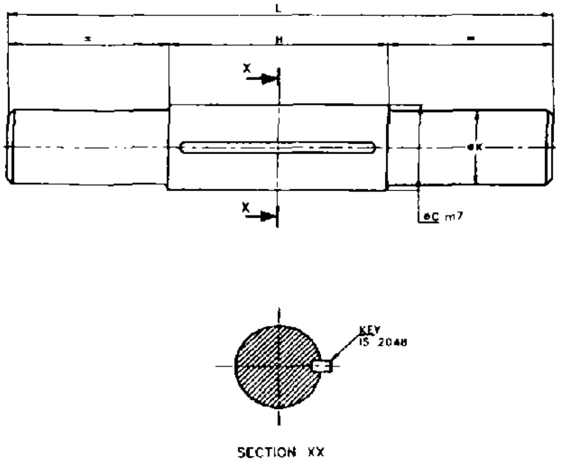
PART No.	NAME OF THE PART
1	STEEL WIRE ROPE
2	SHEAVE
3	WHITE METAL CONE
4	GRIP FOR WHITE METAL CONE
5	LOADING PLATES CONNECTED WITH HYDRAULIC JACK AND GRIP FOR WHITE METAL CONE
6	DOUBLE ACTING HYDRAULIC JACK
7	ANCHORAGE BLOCK FOR DOUBLE ACTING HYDRAULIC JACK
8	POWER PACK FOR THE OPERATION OF HYDRAULIC JACK
9	LOAD INDICATOR
10	THREADED SHAFT FOR ROPE ADJUSTMENT
11	CONNECTING HYDRAULIC HOSE
12	FIXED NUT FOR THREADED SHAFT
13	WHITE METAL CONE
14	GRIP FOR WHITE METAL CONE

FIG 1 TYPICAL RIG FOR PROOF LOAD TESTING OF SHEAVES

Table 1 Dimensions for Head Gear Sheaves — Type A
(*Clause* 5 1)

All dimensions in millimetres





SECTION XX

Sl No	Diameter of Sheave A	Static Rope Tension kN	Static Rope Tension t	*B*	*C*	*H*	*L*	*K*	*N*	Diameter of Spoke	Number of Spokes	Suitable for Steel Wire Rope of Size[1] *Max*	Key Size[2]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1	1 350	13 0	1 325	265	100	320	740	85	320	16	12	14	A 25 × 14
2	1 800	27 5	2 8	265	130	320	800	115	280	20	16	18	A 28 × 16
3	2 100	37 5	3 82	280	150	330	830	120	310	22	20	21	A 28 × 16
4	2 600	64 5	6 57	320	180	370	890	150	350	25	24	27	A 32 × 18
5	2 800	111 5	11 36	320	190	370	900	160	360	28	24	28	A 32 × 18

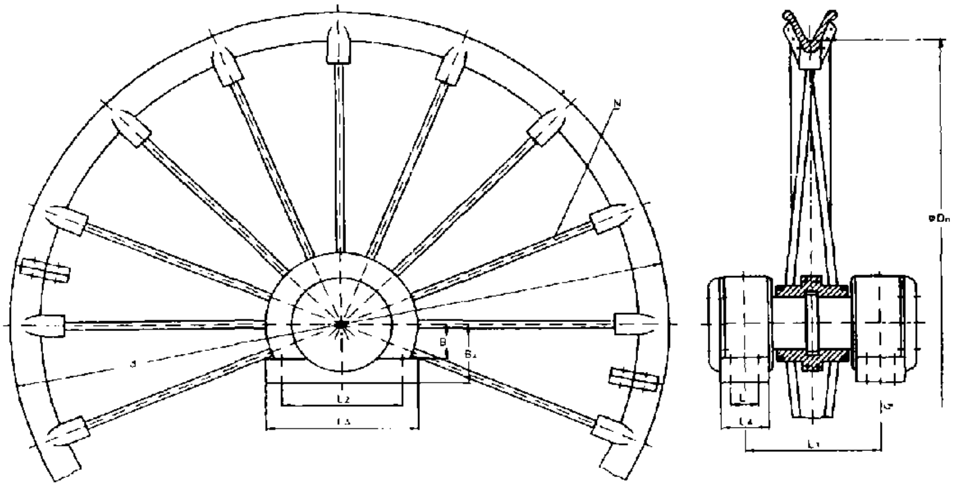
NOTE — Although the table indicates the maximum size of rope which can be used with the corresponding sheave the ropes conforming to IS 1855 of same size or of size smaller than that specified in col 13 are also permitted to be used with the sheave provided that their safe working load does not exceed the static rope tension specified in col 3 for the concerned sheave

[1] According to IS 1855
[2] According to IS 2048

Table 2 Dimensions for Head Gear Sheaves — Type B

(*Clause* 5 1)

All dimensions in millimetres



Sl No	Sheave Diameter	Suitable for Steel Wire Rope of Size[1]	Maximum Rope Tension (kgf) × 10^3	d_0	D_n	L[3]	L_1[3]	L_2[3]	L_3[3]	L_4[3]	B_1[3]	B_2[3]	N	Key Size[2]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
1	3 000	≤ 30	7 8	3 220	3 000	140	670	655	770	250	125	310	28	50 × 28
2	3 200	≤ 32	8 8	3 430	3 200	140	680	730	860	260	125	310	30	50 × 28
3	3 400	≤ 33	9 4	3 640	3 400	145	690	750	880	270	130	320	32	56 × 32
4	3 600	≤ 35	10 6	3 860	3 600	145	700	750	880	280	130	320	34	56 × 32
5	3 800	≤ 38	12 5	4 070	3 800	165	745	800	940	295	140	350	36	56 × 32
6	4 000	≤ 40	13 9	4 280	4 000	165	790	800	940	310	140	350	38	56 × 32
7	4 200	≤ 42	15 3	4 500	4 200	170	830	900	1 060	330	155	380	40	63 × 32
8	4 400	≤ 44	16 8	4 710	4 400	195	865	940	1 110	345	165	410	42	70 × 36
9	4 600	≤ 46	18 4	4 920	4 600	195	880	940	1 110	360	165	410	42	70 × 36
10	4 800	< 48	20 0	5 140	4 800	195	930	940	1 110	380	165	380	42	70 × 36

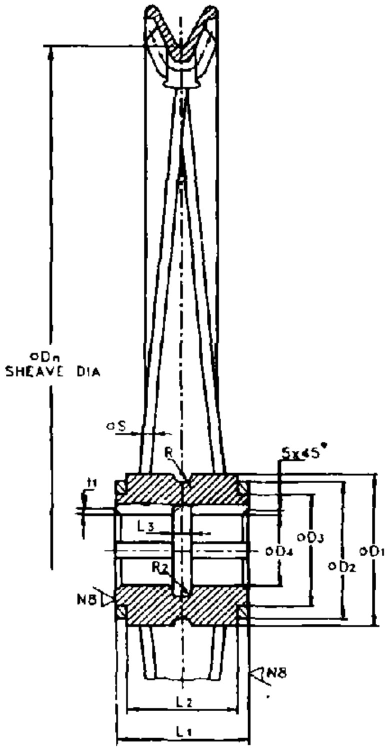
[1] *According to IS 3626*

[2] According to IS 2048

[3] Values are for journal bearing If spherical roller bearing is used suitable values should be adopted

Table 3 Dimensions of Head Gear Sheaves — Hub and Rim — Type B
(*Clause* 5 1)

All dimensions in millimetres



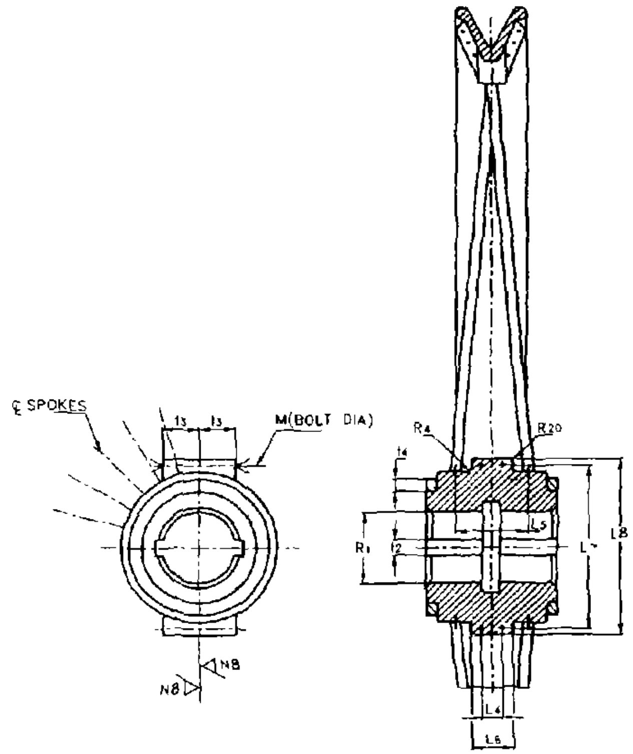
Sl No.	D_n ±2 0	D_1	D_2	D_3 H7/B6	D_4 HB	S	L_1 0 −0 1	L_2	L_3	R	t_1
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1	3 000	425	405	325	205	30	380	310	50	35	11 4
2	3 200	440	425	345	215	32	380	310	50	35	11 4
3	3 400	475	455	375	235	38	380	310	50	35	13 4
4	3 600	500	480	400	235	38	380	310	55	35	13 4
5	3 800	550	530	450	255	40	410	340	60	35	13 4
6	4 000	600	580	500	255	40	440	370	60	40	13 4
7	4 200	650	630	550	275	42	460	390	65	40	12 4
8	4 400	700	680	600	295	45	480	410	70	40	14 4
9	4 600	750	730	650	295	47	490	420	70	40	14 4
10	4 800	800	780	700	315	50	510	440	75	40	14 4

NOTE — Machining of the key-way should conform to IS 2048

Table 4 Dimensions of Head Gear Sheaves — Hub and Rim — Type B

(*Clause* 5.1)

All dimensions in millimetres



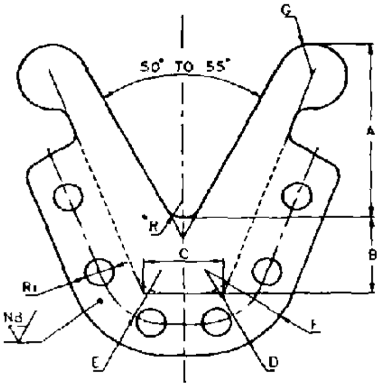
Sl No.	Sheave Diameter D_n	L_4	L_5	L_6	L_7	L_8	t_2	t_3	t_4	R	M
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1	3 000	70	212	115	455	478	50	100	40	260	M 24
2	3 200	70	212	115	470	499	50	100	40	270	M 24
3	3 400	75	220	130	510	537	56	120	40	280	M 27
4	3 600	75	220	130	535	562	56	130	40	280	M 27
5	3 800	86	242	145	590	620	56	140	40	280	M 30
6	4 000	86	257	145	640	670	56	150	40	280	M 30
7	4 200	86	279	168	695	640	63	160	40	325	M 36
8	4 400	86	289	168	745	780	70	170	40	345	M 36
9	4 600	86	294	168	795	830	70	180	40	345	M 36
10	4 800	86	304	168	845	880	70	190	40	380	M 36

NOTE — Machining of the key-way should conform to IS 2048

Table 5 Dimensions of Head Bar Sheaves — Rim and Spoke — Type B

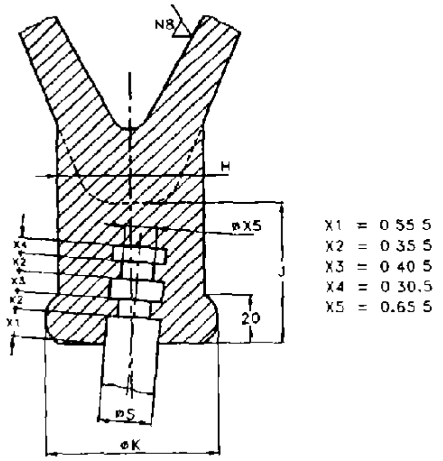
(*Clause* 5.1)

All dimensions in millimetres



• R = 1.10 ROPE DIAMETER

SHEAVE TREAD



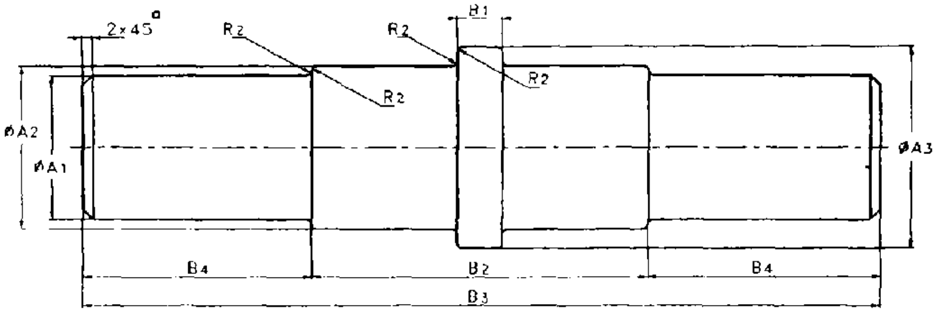
FIXATION OF SPOKE IN TREAD

Sl No.	Sheave Dia mm	*A*	*B*	*C*	*E*	*F*	*G*	*H*	*J*	Bolt *Size* for R_1	Web Thick-ness	*K*	*D*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1	3 000	110	45	45	35	70	20	80	80	M 16	50	100	20
2	3 200	115	50	50	40	80	20	85	85	M 18	50	105	20
3	3 400	120	50	50	40	80	20	90	90	M 18	50	110	20
4	3 600	130	55	55	45	90	20	100	100	M 20	60	120	20
5	3 800	135	60	60	50	100	25	105	105	M 20	60	125	25
6	4 000	140	60	60	50	100	25	110	110	M 22	60	130	25
7	4 200	150	65	65	55	110	25	110	110	M 24	70	130	25
8	4 400	155	70	70	60	120	25	115	115	M 24	70	135	30
9	4 600	160	80	80	70	140	25	120	120	M 24	75	140	30
10	4 800	170	85	85	75	150	25	130	130	M 24	75	150	30

Table 6 Dimensions of Head Gear Sheaves — Axle (with Journal Bearing) —Type B

(*Clause* 5.1)

All dimensions in millimetres



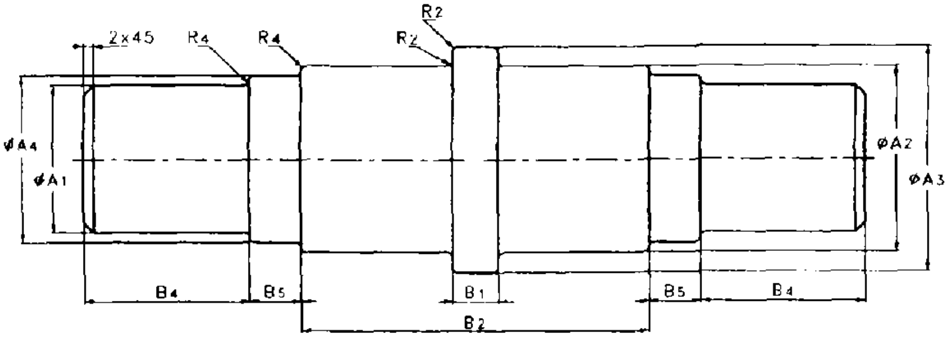
Sl No.	Sheave Diameter	$A_1 fg$	A_2	A_3	$B_{1}{}^{+0.1}_{-0.5}$	B_2	B_4	B_3
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	3 000	180	205	255	50	400	270	940
2	3 200	190	215	265	50	400	280	960
3	3 400	200	235	275	50	400	290	980
4	3 600	200	235	275	55	400	300	1 000
5	3 800	220	255	275	60	430	315	1 060
6	4 000	220	255	275	60	460	330	1 120
7	4 200	240	275	325	65	480	350	1 180
8	4 400	260	295	340	70	500	365	1 230
9	4 600	260	295	340	70	510	380	1 270
10	4 800	280	315	375	75	530	400	1 330

NOTE — Suitable key-way as shown in Tables 2 to 4 should be provided in the axle

Table 7 Dimensions of Head Bar Sheaves — Axle (with Spherical Roller Bearing) — Type B

(*Clause* 5.1)

All dimensions in millimetres



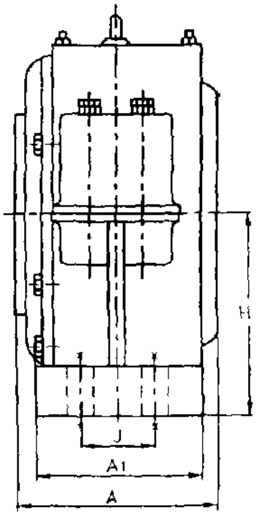
Sl No	Sheave Diameter	A_1 h5	A_4	B_5	B_4	Bearing No.	Housing No.	A_4	B_5	B_4	Bearing No.	Housing No.
			WITH WITHDRAWAL SLEEVE					WITH ADAPTER SLEEVE				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1	3 000	180	192	56	186	22 338	2 338	204	62	201	22 340	2 340
2	3 200	190	202	62	198	22 340	2 340	-		.		
3	3 400	200	222	62	208	22 344	2 344	222	62	210	22 344	2 344
4	3 600	200	222	62	208	22 344	2 344	222	62	210	22 344	2 344
5	3 800	220	242	68	220	22 348	2 348	242	68	227	22 348	2 348
6	4 000	220	242	68	220	22 348	2 348	242	68	227	22 348	2 348
7	4 200	240	262	72	238	22 352	2 352	262	72	240	22 352	2 352
8	4 400	260	282	80	245	22 356	2 356	282	80	254	22 356	2 356
9	4 600	260	282	80	245	22 356	2 356	282	80	254	22 356	2 356
10	4 800	280	302	84	254	22 360	2 360	302	84	263	22 380	2 360

NOTE — Suitable key-way as shown in Tables 2 to 4 should be provided in the axle values of A_2, A_3, B_1 and B_2 should be adopted from Table 6

Table 8 Dimensions of Head Bar Sheaves — Journal Bearings — Type B

(*Clause* 5.1)

All dimensions in millimetres



Sl No.	Sheave Dia	Axle Dia	For Journal Bearing			Housing Base Bolt Size	Bearing No.	Housing No.	For Spherical Roller Bearing				Housing Base Bolt Size
			A	A1	H_1				A	A_1	H_1	J	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1	3 000	180	270	250	300	M 42	22 340	2 340	328	250	310	140	M 42
							(22 338)	(2 338)	(346)	(225)	(280)	(130)	(M 36)
2	3 200	190	280	260	300	M 42	(22 340)	(2 340)	(378)	(250)	(310)	(140)	(M 42)
									330	250	320	145	M 42
3	3 400	200	290	270	310	M 42	22 344	2 344	(380)	(250)	(320)	(145)	(M 42)
									330	250	320	145	M 42
4	3 600	200	300	280	310	M 42	22 344	2 344	(380)	(250)	(320)	(145)	(M 42)
									360	280	350	165	M 42
5	3 800	220	315	295	340	M 42	22 348	2 348	(425)	(280)	(350)	(165)	(M 42)
									360	280	350	165	M 42
6	4 000	220	330	310	340	M 42	22 348	2 348	(425)	(280)	(350)	(165)	(M 42)
									384	305	380	170	M 48
7	4 200	240	350	330	350	M 48	22 352	2 352	(454)	(305)	(380)	(170)	(M 48)
									420	340	410	195	M 48
8	4 400	260	365	345	380	M 48	22 356	2 356	(485)	(340)	(410)	(195)	(M 48)
									420	340	410	195	M 48
9	4 600	260	380	360	380	M 48	22 356	2 356	(485)	(340)	(410)	(195)	(M 48)
									384	305	380	170	M 48
10	4 800	280	400	380	400	M 48	23 260	3 260	(454)	(305)	(380)	(170)	(M 48)

NOTE — Figures shown in bracket indicate values with adapter sleeve

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No	*Title*
210 1993	Grey iron castings (*second revision*)
1364 (Part 1) 1992	Hexagon head bolts, screws and nuts of products Grades A and B Part 1 Hexagon head bolts (size range M 1 6 to M 64) (*third revision*)
1570 (Part 2/ Sec 1) 1979	Schedules for wrought steels Part 2 Carbon steels (unalloyed steels), Section 1 Wrought products other than wire with specific chemical composition and related properties (*first revision*)
1855 1977	Standard steel wire ropes for winding and man-riding haulages in mines (*first revision*)
1862 1975	Studs (*second revision*)
1875 1992	Carbon steel billets, blooms, slabs and bars for forgings (*fifth revision*)
2048 1983	Parallel keys and keyways (*second revision*)
3626 1978	Loacked coal winding ropes (*first revision*)
8500 1991	Structural steel — Microalloyed (medium and high strength qualities) (*first revision*)

ANNEX B

(*Clause* 10)

CERTIFICATE OF TEST AND EXAMINATION

We hereby certify that the headgear sheaves supplied hereunder conform in all respects to IS 9239 1998 The following are their detailed particulars

a) *General Details*
  - i) Sl No of sheaves
  - ii) Sheave(s) designation
  - iii) Manufacturer's identification mark
  - iv) Sheave(s) diameter, mm
  - v) Safe working load, kN
  - vi) Remarks

b) *Particulars of Materials Employed*

i)	Rim	to IS
ii)	Spokes	to IS
iii)	Hub	to IS
iv)	Axle	to IS
v)	Bearing	to IS

c) *Results of Tests*
  - i) Crack detection test
  - ii) Static balancing test
  - iii) Proof load test

d) *Any other particulars/specifications*

Manufacturer's signature
Designation
Date of test examination

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